PATENT SPECIFICATION

475,021

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COMPLETE SPECIFICATION

Improvements in Change Speed Gears for Chain Drives

We, ERVIN VANTOCH, of 104, Gloucester Road, Regent's Park, London, N.W.1, and JOSEF KNEIFEL, of 914, Modrany, Czecho-Slovakia, both citizens of Czecho-Slovakia, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to change speed gears for chain drives and has for its object to provide a simple, cheap and reliable device of this nature, suitable for application for example to bicycles. The invention relates more particularly to change speed gears for chain drives, wherein drive is transmitted selectively from a driving sprocket to one of a plurality of driven sprockets.

According to the invention, the coaxial driven sprockets of progressively varying diameters and of equal tooth pitch are fixedly mounted on a driven member and each is provided by the reduction of tooth thickness with two spaced marginal ramps sloping in opposite directions, the corresponding ramps on adjacent sprockets sloping in the same direction and forming a substantially helical path for the passage of the chain from one sprocket to the other. At least one tooth may be omitted on one or several of the sprockets where the path passes from one sprocket to the other.

Means are provided for flexing the chain transversely of the plane of the sprockets while it is driving one of them and when one of the ramps arrives in the course of rotation at the flexed portion of the chain same runs on the ramp and is deflected from this sprocket to be picked up by the adjacent one towards which it has been flexed.

The means for flexing the chain may comprise a rockable fork embracing it, means being provided for operating the fork and such fork operating means being preferably so constructed as to operate a jockey pulley for taking up the slack in the chain when the drive is transmitted to any but the largest of driven sprockets, the operation of the fork and jockey pulley being simultaneous.

The invention will now be more particularly described with reference to the accompanying drawing, which shows an embodiment of the invention by way of example.

Fig. 1 is a side elevation of a set of three driven sprockets, only fragments of the two smaller ones being shown.

Fig. 2 is a diagrammatic illustration of the application of the invention to a bicycle, on a smaller scale.

Fig. 3 is a side elevation and Fig. 4 a fragmentary plan view of the chain flexing fork.

Fig. 5 is an end elevation of the jockey pulley and its mounting.

Fig. 6 is a side elevation of the fork and jockey pulley operating means.

Referring to the drawing, the chain 1 (Fig. 1) is shown driving the largest of the three sprockets 2, 3 and 4 of progressively varying diameters and equal tooth pitch. The sprockets are splined on a driven member 5, which in this example is in the form of a hub which may be embodied, for example, in the rear axle assembly of a bicycle and may house or form part of a free wheel.

Each of the sprockets 2, 3 and 4 is provided by the reduction of tooth thickness with two spaced marginal ramps respectively indicated at 6 and 7 on the sprocket 2. The ramp 6 slopes in one direction and the ramp 7 in the opposite direction, as shown, while the ramps on sprockets 3 and 4 corresponding to 6 slope in the same direction as 6 but are angularly displaced with reference thereto and to one another so as to form a substantially helical path for the passage of the chain from one sprocket to the other. In the example shown in Fig. 1, the chain is on the largest sprocket 2, and when it is flexed transversely of the plane of sprocket 2 towards sprocket 3, for example by means of a fork 8 (Figs. 2 and 3) the tooth 9 in the ramp 7 will not engage in the links of the chain owing to same having been moved out of its plane, but the thinned leading side 10 of tooth 9 will engage behind the chain and force same up on the ramp 7, whereby the chain will be further deflected into

the plane of sprocket 3. The first tooth of sprocket 3 to approach the chain will then engage in the links thereof and thus sprocket 3 will gradually pick up the chain as it gradually leaves sprocket 2, whereby the gear change is effected. The chain moves on a helical path and the engagement of the chain by sprocket 3 at the initial stage is facilitated by the fact that the corresponding ramps 7 on the adjacent sprockets 2 and 3 themselves form part of the helical path on which the chain moves on gear changing.

Changing from sprocket 3 to sprocket 4 is effected in the same manner and changing from a smaller to a larger sprocket is effected in a similar manner with the aid of the ramp 6 and the ramps corresponding thereto on sprockets 3 and 4.

In the example shown the flexing of the chain is effected by means of a fork 8 mounted on the bicycle frame (in the application of the invention to a bicycle as shown in Fig. 2) for rocking about a substantially vertical axis and engaging the lower run of the chain near the sprockets 2, 3 and 4. The fork is spring pressed in one direction and has a lateral arm 11 to which is attached one end of a cable 12, the other end of which is attached to the arm 14 of a bell crank lever 13, 14 mounted within the reach of the rider (Figs. 2 and 6), the arm 14 of said lever serving as a gear change lever. The arm 14 is provided with a peg (not shown) which is adapted to engage in arcuately disposed holes 15 of a plate 16, the holes 15 corresponding to the various angular positions of the fork 8 in the planes of the various sprockets 2, 3 and 4. The bell crank 13, 14 is spring pressed in direction of rotation, a spring 17 being provided for this purpose and it is pressed towards the plate 16 by a springy blade 18, the purpose of which is to maintain engagement between the peg of the gear lever 14 and the holes 15.

A jockey pulley 19 is mounted on a one armed lever 20, which is mounted for rocking about a substantially horizontal axis on the bicycle frame. The lever 20 is connected by a cable 21 to the arm 13 of the bell crank 13, 14, the arrangement being such that when the gear lever 14 is moved for changing over to a smaller sprocket the jockey pulley is rocked for taking up the slack in the chain and when the gear lever is moved for changing to a larger sprocket the jockey pulley lever is rocked for permitting the slack to be taken up by the larger sprocket. In Fig. 2 the chain is on the smallest sprocket and the jockey pulley 19 is shown in full lines in the position for taking up the greatest slack, while the dotted position is one which the jockey pulley occupies when the chain is on the largest sprocket. A spring 22 presses the jockey pulley into engagement with the chain, as shown in Fig. 5.

As will be seen in Fig. 1, the slope of the ramps 6 and 7 is such that the tooth at the thinnest part of the ramp disappears (i.e. the tooth next to 9 in clockwise direction in the case of ramp 7), whereby the flexing of the chain for the passage thereof from one sprocket to the other is facilitated. This arrangement is preferred, but is not absolutely necessary, and in the case of sprockets of small diameter, e.g. 4 in Fig. 1, it may be omitted altogether, even if employed in the case of the larger sprockets, such as 2 and 3.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A change speed gear for chain drives, wherein drive is transmitted selectively from a driving sprocket to one of a plurality of driven sprockets, characterized in that the coaxial driven sprockets are fixedly mounted on a driven member and each is provided by the reduction of tooth thickness with two spaced marginal ramps sloping in opposite directions, the corresponding ramps on adjacent sprockets sloping in the same direction and forming a substantially helical path for the passage of the chain from one sprocket to the other.

2. A change speed gear according to Claim 1, wherein at least one tooth is omitted on one or several of the driven sprockets where the ramp is thinnest, i.e. where the helical path passes from one sprocket to the other.

3. A change speed gear according to Claim 1 or 2, wherein the driven sprockets are splined on a hub adapted to house or formed as part of a free wheel.

4. A change speed gear according to any of the preceding claims, wherein the chain is passed from one driven sprocket to the other by means of a member rockable transversely of the plane of the sprockets and adapted to flex the chain out of the plane of one sprocket and into the plane of an adjacent sprocket.

5. A change speed gear according to claim 4, including a jockey pulley for taking up the slack in the chain when same is on any but the largest driven sprocket, wherein the jockey pulley is operated simultaneously with the chain flexing member by means of a common gear lever.

6. A chain drive change speed gear

substantially as herein described with reference to the accompanying drawing.

Dated this 15th day of June, 1937.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

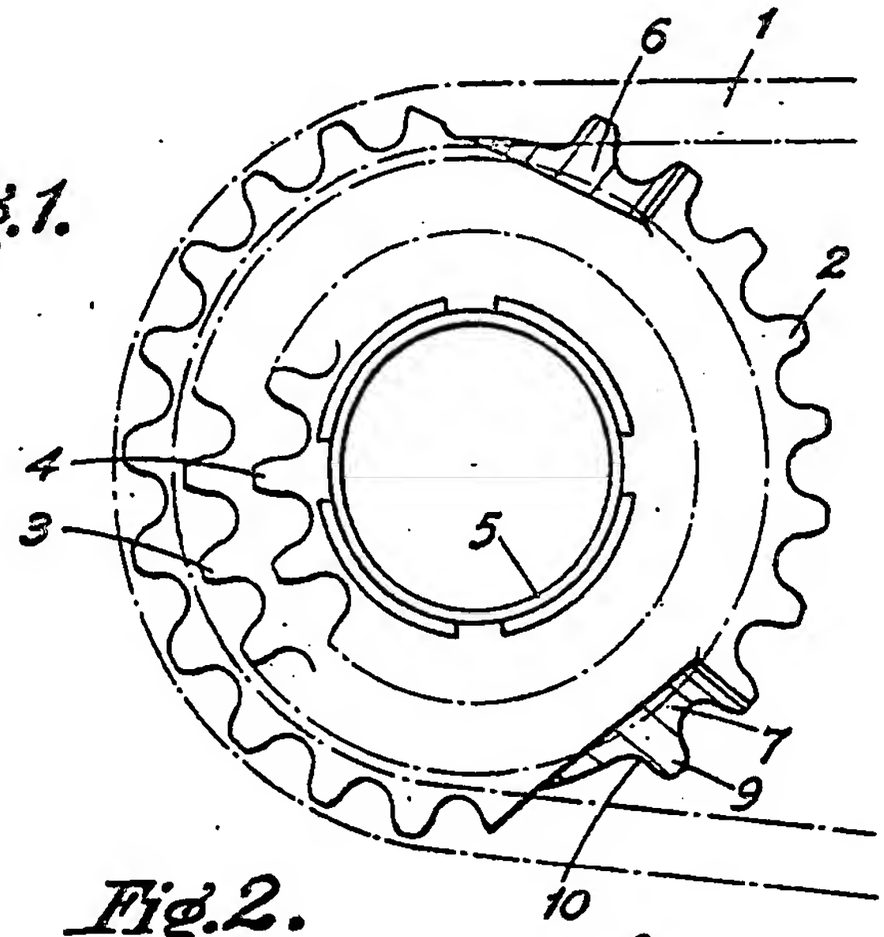

Fig. 2.

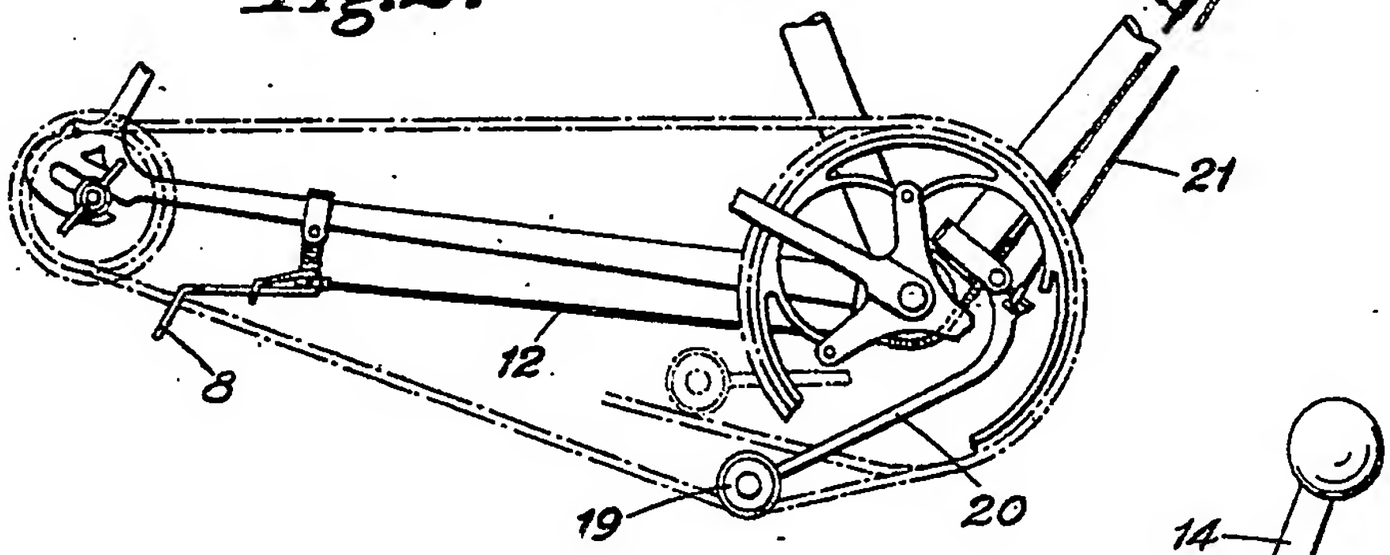

Fig. 5.

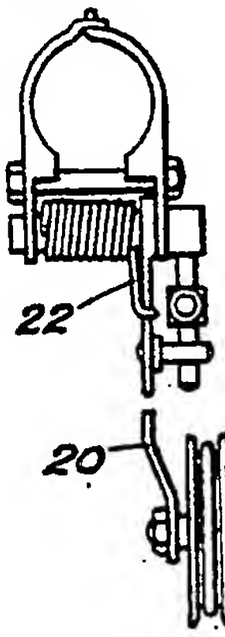

Fig. 6.

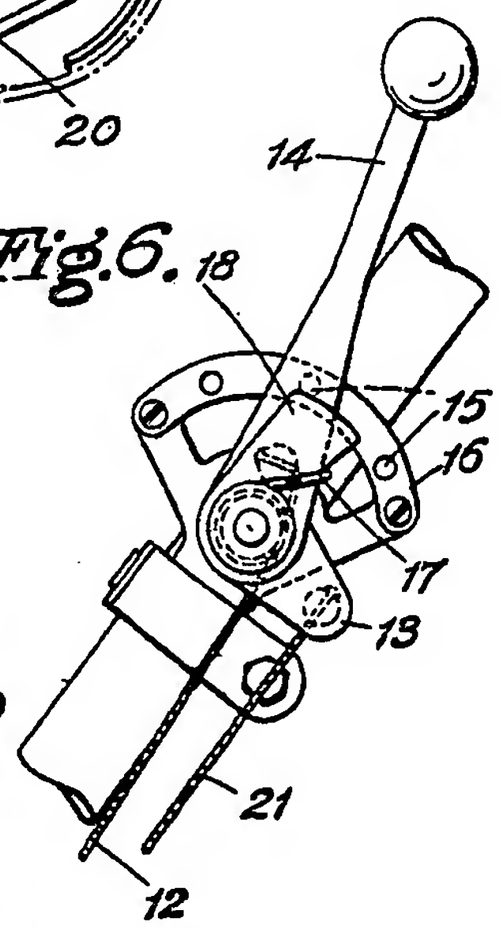

Fig. 3.

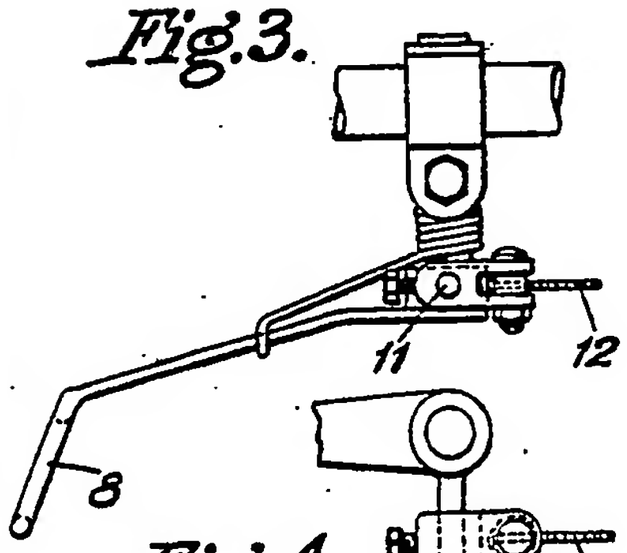

Fig. 4.

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